
A "living bioreactor" for the production of tissue-engineered small intestine.

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Authors: Daniel E Levin, Frederic G Sala, Erik R Barthel, Allison L Speer, Xiaogang Hou, Yasuhiro Torashima, Tracy C Grikscheit

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Public Summary:

Here, we describe the use of a mouse model as a living bioreactor for the generation of tissue-engineered small intestine. Small intestine is harvested from donor mice with subsequent isolation of organoid units (a cluster of mesenchymal and epithelial cells). Some of these organoid units contain pluripotent stem cells with a preserved relationship with the mesenchymal stem cell niche. A preparation of organoid units is seeded onto a biodegradable scaffold and implanted intraperitoneally within the omentum of the host animal. The cells are nourished initially via imbibition until neovascularization occurs. This technique allows the growth of fully differentiated epithelium (composed of Paneth cells, goblet cells, enterocytes and enteroendocrine cells), muscle, nerve, and blood vessels of donor origin. Variations of this technique have been used to generate tissue-engineered stomach, large intestine, and esophagus. The variations include harvest technique, length of digestion, and harvest times.

Scientific Abstract:

Here, we describe the use of a mouse model as a living bioreactor for the generation of tissue-engineered small intestine. Small intestine is harvested from donor mice with subsequent isolation of organoid units (a cluster of mesenchymal and epithelial cells). Some of these organoid units contain pluripotent stem cells with a preserved relationship with the mesenchymal stem cell niche. A preparation of organoid units is seeded onto a biodegradable scaffold and implanted intraperitoneally within the omentum of the host animal. The cells are nourished initially via imbibition until neovascularization occurs. This technique allows the growth of fully differentiated epithelium (composed of Paneth cells, goblet cells, enterocytes and enteroendocrine cells), muscle, nerve, and blood vessels of donor origin. Variations of this technique have been used to generate tissue-engineered stomach, large intestine, and esophagus. The variations include harvest technique, length of digestion, and harvest times.

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